



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460**

**OFFICE OF  
PREVENTION  
PESTICIDES AND TOXIC  
SUBSTANCES**

**Memorandum**

**Date:** August 29, 2001

**SUBJECT:** Southern Pine Seed Orchard Initial Benefits Assessment for Azinphos-methyl and Phosmet

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**Summary**

There would be significant grower-level impacts, impacts on the seed industry, and on supplies of the seeds if both azinphos-methyl and phosmet were lost, but not if one or the other were lost. Extending the REIs for these chemicals would impact the critical activities of mowing, cone harvesting, and scouting.

Southern pine seed is a very high value crops with seed valued at \$2,917 per pound. Assuming that southern pine seed yield losses of 30-70 percent are realized based on the scenario that both azinphos-methyl and phosmet were not available nor other alternatives are as efficacious, and that replanting costs and the losses due to the lag to regenerate production again are not included, impacts to national gross revenue for pine seed producers is estimated to range from \$105 million to \$245 million annually.

Assuming azinphos-methyl and phosmet are as equally efficacious (given that azinphos-methyl and phosmet are both considered suitable alternatives) and that phosmet will become the control of choice if azinphos-methyl is cancelled, then a cost savings of approximately \$10,000 in control costs would arise due to the difference in the annual application cost of phosmet. This is a tentative scenario since the effectiveness of phosmet on coneworms and seed bugs has not been definitively evaluated.

## Background

### Production

This industry includes only Southern ‘yellow’ pines, not Ponderosa or Northwestern pines. For established orchards, bearing trees are large (e.g., up to 50 ft tall) and harvesting of pine cones is done by hand from a cherry picker. The goal of the orchards is genetic improvement to enhance desirable heritable traits such as faster-growing pulpwood trees. First generation trees for seed start out as grafted limbs. Second generation seed orchards are planted from seed. Pollination is also accomplished by hand from a cherry picker. Total U.S. Southern pine seed acreage is 20,000 acres with approximately half or only 10,000 acres producing seeds. The other 10,000 acres are not in seed production because the trees are either too old or too young to produce seeds and they are not treated. Total U.S. Southern pine seed production is 120,000 lb, with a value of \$350 million, or **\$2,917** per pound (See table below). This is enough to supply demand for 1.2 billion seedlings annually. The seedlings are used to replace trees cut for pulpwood and are re-planted at the density of 500-800 trees per acre depending upon variety and locality. In 1999, 95% of the acres and production were in the combined southern and gulf areas of AL, AR, MD, MS, LA, OK, TN, TX, FL, GA, SC, and NC. The demand for pulp is increasing annually.

Pine Seed Orchard Production Profile					
Total Acreage Nationally	Total Acres Harvested	Average # of Pounds/Acre	Average Price per Pound	Total Production in Pounds	Estimated Total Value of Production
20,000	10,000	12	\$2,917	120,000	\$350 million

### Use of Azinphos-methyl and Phosmet on Pine Seed Orchards

Azinphos-methyl is the preferred OP for the industry. Phosmet was registered in 2000 for the identical use and so far has not yet been used on significant commercial acreage by the industry, but its use is expected to increase.

### Target Pests

The primary target pests for pine seed producers are the *Dioryctria* coneworm complex and the *Leptoglossus* and *Tetyra* seed bug complex. These pests feed directly on developing cones reducing seed yield. Seed production is on an annual cycle with one harvest per year in October.

### Timing

Azinphos-methyl applications begin right after pollination when the cones start to develop. There may be up to 3 aerial applications during the period between May and August. The last application generally occurs 30 to 45 days prior to harvest. Tractor mowing between and within rows is done 2-6 times during this period between applications and before harvest to reduce fire hazards and reduce weed competition.

The first pesticide application on cones in spring is usually esfenvalerate, permethrin, or bifenthrin (pyrethroids). They are as effective as azinphos-methyl, but a second successive application of pyrethroids is not practiced because it decimates beneficial insects and triggers a secondary economic outbreak of scale insects. Azinphos-methyl (and possibly phosmet) is the only effective control for scales. Pine seed orchards experiencing a scale outbreak would abandon the use of pyrethroids during the next growing season and treat exclusively with azinphos-methyl and phosmet. After the initial pyrethroid application, azinphos-methyl is used for up to 3 applications. Phosmet became available in 2000 and is gradually being accepted by producers and worked into the rotation as an alternative to azinphos-methyl. Preliminary experiments have shown it is as efficacious as azinphos-methyl. Pyrethroids are again used for the last application before harvest of the cones in September and October. Lambda cyhalothrin, another pyrethroid, is in the research pipeline. The organophosphate acephate is available only in North Carolina under a Special Local Need registration.

A national survey of 51 seed orchards by the industry found that, between 1997 and 1999, an estimated average of 21% of the 10,000 acres harvested were treated with azinphos-methyl. During that period, the average lb/acre/application was 1.55 pounds a.i. and the average number of applications/acre was 2.76. An expert in 2001 estimated that 95% of the cone-producing acreage could lose 30-70% of the crop without azinphos-methyl, assuming no other equally efficacious alternative was available. Some individual orchards could experience yield losses as high as 95%.

### **Restricted Entry Intervals (REIs)**

**Azinphos-methyl:** Current azinphos-methyl labels have a 2 day REI for mowing, scouting, and irrigating, which increases to 3 days in localities with less than 25 inches of average annual rainfall. There is a 4 day REI for other activities, which increases to 5 days in localities with less than 25 inches average annual rainfall. Please refer to the occupational and residential human health risk assessment on the Agency's website (<http://www.epa.gov/pesticides/op>) for information concerning the worker risks associated with the restricted entry intervals for this chemical. There is only aerial application on the label at a maximum rate of 1.5 lb ai/acre/application and up to 3 applications per year.

It is important to note that most of the activities except pollination and harvesting occur on the ground. Mowing is a critical activity because it reduces nutrient competition but more importantly reduces the fire hazard. Grafted trees are especially susceptible to being killed by fire. Fire would be devastating not only because of the economic loss but also because of the disruption to the production cycle. It would take several years for growers to recover from fire losses due to the length of time for a replanted pine seed orchard to become viable again.

**Phosmet:** Current phosmet labels have a 1 day REI for all activities with no PHI. Please refer to the occupational and residential human health risk assessment on the Agency's website (<http://www.epa.gov/pesticides/op>) for information concerning the worker risks associated with the restricted entry intervals for this chemical. Ground, aerial, and chemigation rate is a maximum of 1.05 lb ai/acre/application and up to 6 applications per year:

### **Impacts Related to Occupational Risk Mitigation**

#### **Azinphos-methyl**

There is very little background information concerning its use on this crop. Contact with one pine seed orchard expert indicated that extending the restricted entry intervals to 14 days for cone harvesting and 7 days for mowing, scouting, and irrigating may be workable within the existing practices on the crop. Based on the lack of information to the contrary, BEAD concludes that extending the restricted entry intervals beyond these intervals for azinphos-methyl beyond this **would have** a major impact on the production of this crop if phosmet is not available as an alternative.

## Phosmet

Because this chemical is considered a new use on Southern pine seeds (registered in 2000), there is no historical information concerning its use on this crop. Based on the lack of information to the contrary, BEAD concludes that extending the restricted entry intervals beyond 14 days for cone harvesting and 7 days for mowing, scouting, and irrigating, could result in major impact on the production of this crop if azinphos-methyl is not available as an alternative.

## Comparison of Alternative Control Costs

The table below illustrates the Average and Range for Costs of Major Alternatives for Southern Pine Seed Orchards.

Alternative	Average Cost per Pound AI	Estimated Yearly Application Cost	Average Pounds/Acre /Application	Maximum Number of Applications Per Year	Total Pounds AI Applied/Acre
Azinphos-methyl	\$9.20	\$41.40	1.5	3	4.5
Phosmet	\$6.25	\$39.38	1.05	6	6.3
Esfenvalerate	\$206	\$51.50	.17	1	.17
Bifenthrin	\$388.35	\$58.25	.15	1	.15
Permethrin	\$120.15	\$30.05	.25	1	.25
Lambda cyhalothrin (not registered yet)	Not Available	NA	NA	NA	NA

Azinphos-methyl is critically needed for pest control in southern pine seed orchards and its loss would have a large detrimental impact on the industry. Phosmet has the potential to be an equivalent alternative but it will require 1-2 years of field testing to confirm this. If the azinphos-methyl REI is extended so that mowing is prohibited, there will be significant impacts in the orchards. Mowing is critical to manage fire hazards. Grafted trees are very susceptible to being killed by fire. Accidental fires in pine forests due to lightning are common in the south. Mowing is also critical to remove trees and weeds that can out-compete the crop for water, as those orchards are not irrigated. Herbicides are not a substitute for mowing because of excessive costs, inadequate control, and frequency of re-application. Trees in production orchards are spaced apart on 25 ft intervals, so there is a large amount of between-tree area to apply an herbicide. The indirect detrimental effects of reduced mowing on yield and quality of seed are probably moderate to high because of possible loss to fire and weed competition for water. The extension of the phosmet REI will probably have less impact than the extension for azinphos-methyl because it is significantly shorter than that for azinphos-methyl.

## Characterization of Impacts on Crop

There would be significant regional and national grower-level impacts, impacts on the national seed industry, and on supplies of the seeds if both azinphos-methyl and phosmet were lost, but not if one or the other were lost. The main driving factor is that southern pine seed is such a high value crop with an average dollar per pound value \$2,917 per pound.

### **Impacts without Azinphos-methyl and Phosmet.**

Assuming that southern pine seed yield losses of 30-70 percent are realized based on the scenario that both azinphos-methyl and phosmet were lost, impacts to gross revenue for the Southern Pine Seed producers is estimated to range from \$105 million to \$245 million annually.

### **Impacts due to the Loss of either Azinphos-methyl or Phosmet.**

The effectiveness of phosmet against coneworms and seed bugs has not been definitively established. In single tree evaluations, phosmet was found to be as effective as azinphos-methyl. Phosmet has not been evaluated in large scale tests and therefore secondary pest outbreaks and other site specific interactions have not been evaluated. Assuming azinphos-methyl and phosmet are equally efficacious, the loss of either insecticide would result in the substitution of the other. Three applications of azinphos-methyl cost about \$1.00 more than six applications of phosmet. If phosmet were to become the control of choice, then pine seed orchard producers would experience a cost savings of \$1.00 per acre or an industry wide cost savings of \$10,000 (\$1.00 x 10,000 acres). The industry claims that an OP must be kept for mid-season control and that "pyrethroid only" applications may occur early season and one application late season because pyrethroids tend to kill off beneficial insects, as well as target pests, leading to massive secondary scale infestations, which require additional controls (i.e. azinphos-methyl or phosmet).

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